

Compressors

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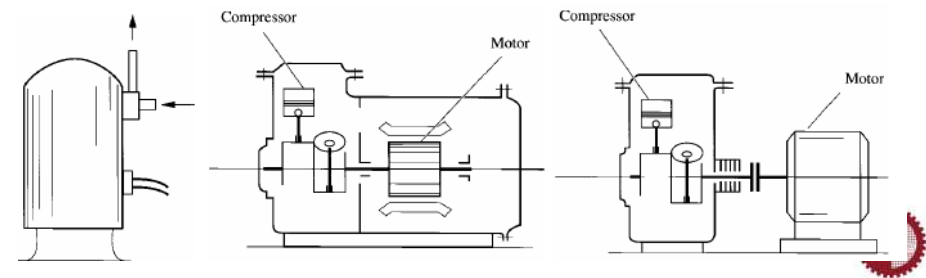
ME 415: Refrigeration & Building Mechanical Systems



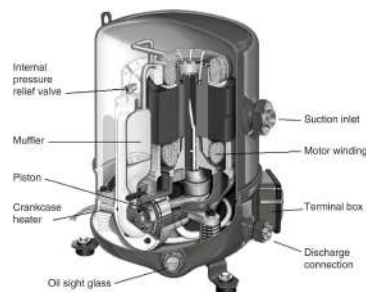
Compressors

The purpose of the compressor in the vapour compression cycle is to compress the low-pressure dry gas from the evaporator and raise its pressure to that of the condense. Compressors can be:

- 1 Hermetic/sealed/welded
- 2 Semi-hermetic/accessible hermetic
- 3 Open



Hermetic Compressor

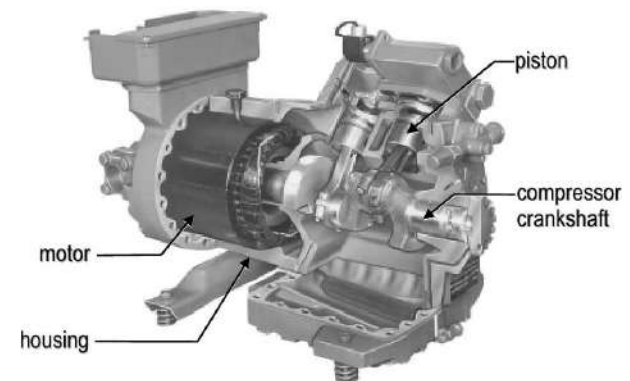


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- Motor is sealed within compressor housing and is cooled by refrigerant, either by refrigerant vapour that is being drawn into the compressor from the suction line or by liquid refrigerant that is being drawn from the liquid line.
- It eliminates the need for the shaft couplings and external shaft seals that are associated with open compressors.
- Repair of hermetic compressor is tedious.



Semi-hermetic Compressor

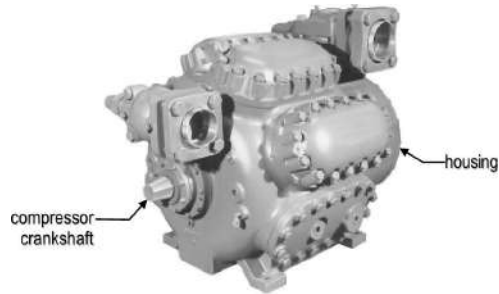


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- Motor for semi-hermetic compressor is contained within the compressor housing and is cooled by the refrigerant.
- The sealed housing is designed to be opened to repair or overhaul the compressor or motor.



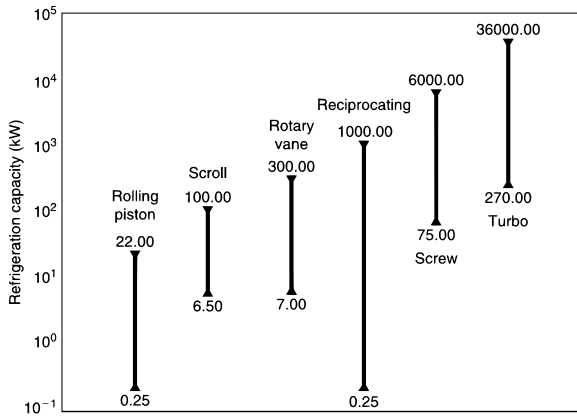
Open Compressor



- e532
- Open compressor is driven by external power source, such as an electric motor, an engine or a turbine. Power shaft protrudes through the compressor housing and seal is required to prevent refrigerant from leaking out of the compressor housing.
 - Motor is cooled by air that is drawn in from the surrounding.

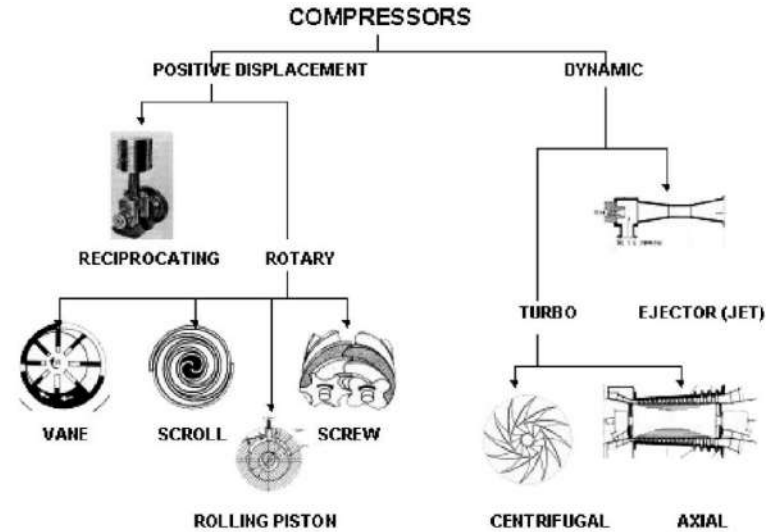


Positive displacement types compress discrete volumes of low-pressure vapour by physically reducing the volumes causing a pressure increase, whereas dynamic types raise the velocity of the low-pressure gas and subsequently reduce it in a way which caused pressure rise.



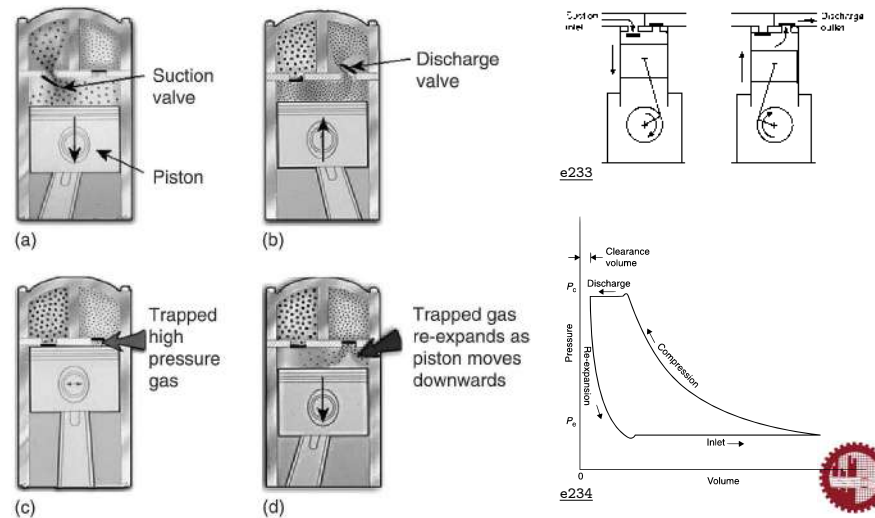
e540 *Approximate range of capacity covered by various compressor types*

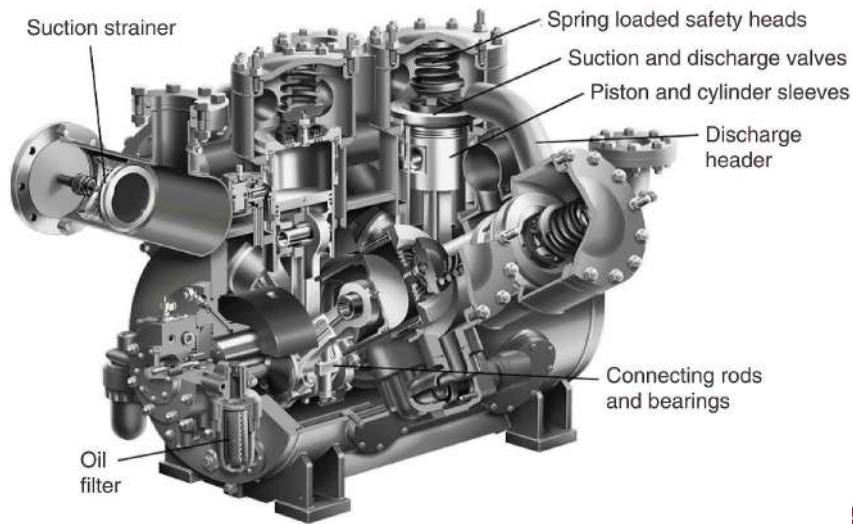
Compressor Types



Positive Displacement Compressors

Reciprocating Compressor



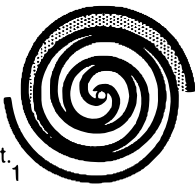


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Scroll Compressor

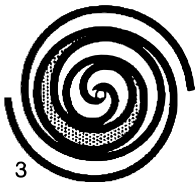
Interaction of an orbiting spiral and a stationary spiral generates the compression process. Gas enters an outer pocket.



1



2 The pocket is sealed off, compression starts



3 The pocket is reduced in size



4 As the pocket reaches the centre, the discharge port is uncovered

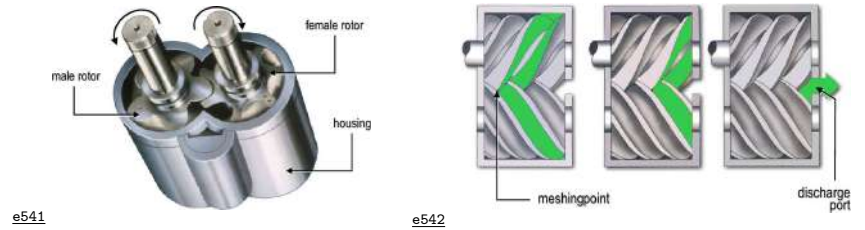


5 During the process all six pockets are in various stages of compression

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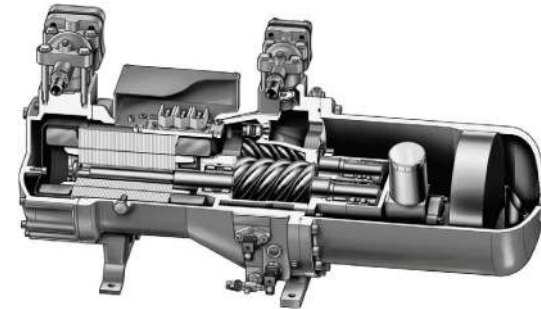


Screw Compressor



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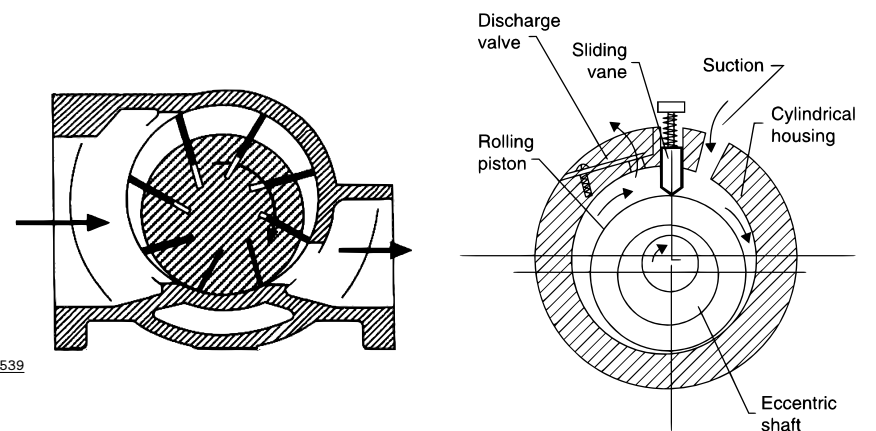
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Sliding & Rotary Vane Compressors

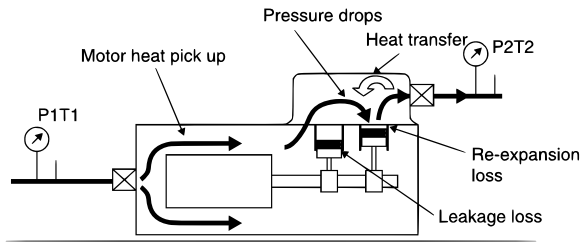


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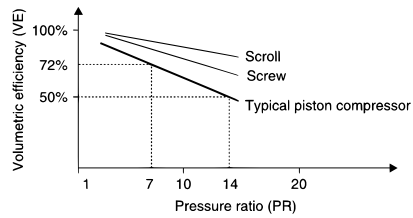
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Volumetric Losses of +ve Displacement Compressors



$$\text{Volumetric efficiency (VE)} = \frac{\text{Actual volume flow at suction}}{\text{Compressor displacement}}$$

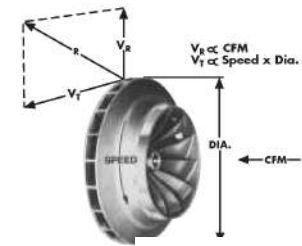


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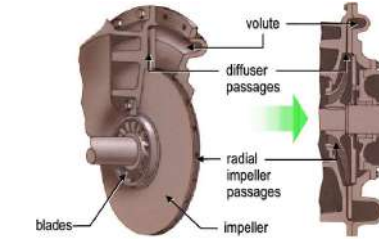
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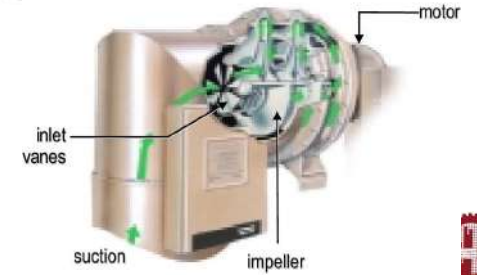
Centrifugal Compressor



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